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Title

10 **WATER RUNOFF DEFLECTOR FOR A VEHICLE AT A LOADING DOCK**

Inventor

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Gary Borgerding

Background of the Invention

Field of the Invention

The present invention relates generally to loading docks and, more particularly, to a sealing apparatus for deflecting runoff along an upper surface of a vehicle at the dock.

Description of Related Art

Trucks having open rear cargo bays are typically backed into alignment with a loading dock or other doorway of a building to facilitate loading or unloading of the truck's cargo. To protect the interiors of the building and the truck from the outside weather during loading and unloading, the space between the rear of the truck and the face of the building can be at least partially sealed off by installing either a loading dock shelter or a loading dock seal around the perimeter of the doorway

Conventional loading dock seals comprise resilient, compressible pads that are attached to the building along the top and lateral edges of the doorway. The pad compliantly conforms to the rear contour of the truck as the truck presses up against the pad, thereby sealing the gap between the face of the building and the rear of the truck.

Dock shelters typically have rigid frame members, rather than compressible pads, installed along the top and lateral edges of the doorway. The frame members usually protrude one to three feet from the outside face of the building. To avoid being struck and damaged by a truck backing into the dock, the frame members are spaced farther away from the doorway than are the compressible pads of dock seals.

Flexible side curtains attached to distal edges of the frame members lie generally parallel to the face of the building and extend into the anticipated path of the truck. As a truck backs into the dock, the side and head curtains sweep across the sides and top, back corner of the truck to provide sealing between the building and the rear of the truck.

Under most conditions, dock seals and dock shelters effectively seal out weather, but in certain situations additional protection is needed. If snow, for instance, accumulates on the top of the truck while the truck is parked at the dock, warm air from inside the building may warm the truck's cargo bay. This can begin

melting the snow atop the truck, which can turn the snow to slush. The liquid nature of the slush can allow it to flow back toward the loading dock. Absent an effective top seal, slush or other liquid has the potential of spilling off the trailer and into the loading dock area. The problem is worse when a sloped driveway leans the truck toward the dock. A similar runoff problem may occur with heavy rain.

To address the runoff problem, U. S. Patents 6,233,885 and 6,550,191 disclose a roller sealing apparatus that provides a flow deflector along the roof of the truck. The apparatus includes a cylindrical roller that rides up and over the top of the truck as the truck backs into the dock. To help protect the roller from the truck's impact, the rear edge of the truck lifts the roller into position by pushing against a stiffener (175), which in turn pushes against a ramp (180). The ramp forces the roller's support (120) to move the roller up and over the truck. When resting atop the truck's roof, the roller blocks any water flowing toward the back of the truck and redirects it to drain off to either side of the truck.

Unfortunately, such a roller sealing apparatus tends to be expensive as it has to be built sturdy enough to withstand relatively high forces generated by a departing truck that includes an upwardly protruding lip along the upper rear edge of the truck. High forces can develop as the protruding lip of the departing truck catches on some edge or surface of the sealing apparatus, such as the lower edge of the ramp. Other high forces can be caused by an exceptionally tall truck backing into the dock such that the truck's upper rear edge strikes the roller sealing apparatus near the pivot point of the roller's support. In some cases, the forces may tend to lift the sealing apparatus' entire supporting framework.

Summary of the Invention

In some embodiments, a runoff deflector includes a frame mountable to a building wall, a seal adapted to redirect water flowing across the top of a truck, a pliable curtain that suspends the seal from the frame, and a front bumper that helps protect the seal from vehicular impact and acts as a lever or lift to raise the seal on top of the

In some embodiments, the seal is a cylindrical tube that rolls, and in other embodiments, the seal is cylindrical tube that does not roll.

In some embodiments, the pliable curtain that suspends the seal also wraps around the seal, acting as a cradle to help support the seal while it is at rest.

5 In some embodiments, a front bumper that helps protect and lift the seal comprises two panels that are movable relative to each other.

In some embodiments, a front bumper that helps protect and lift the seal comprises two panels, wherein one panel is more flexible than the other.

10 In some embodiments, a front bumper that helps protect and lift the seal comprises at least three panels that are each movable relative to the others.

In some embodiments, a front bumper that helps protect and lift the seal is stiffer in one direction more than another.

In some embodiments, a front bumper includes a curved distal edge that helps protect the deflector from being damaged by a departing vehicle.

15 In some embodiments, a runoff deflector includes a pivotal frame covered by a pliable sheet that supports the frame.

In some embodiments, a runoff deflector includes a back bumper that does not protrude any farther forward than the deflector's seal.

20 In some embodiments, a runoff deflector includes a front bumper and a back bumper, wherein the front bumper is more flexible than the back bumper.

Brief Description of the Drawings

25 Figure 1 is a perspective view of a water runoff deflector in a pendant position, wherein part of the deflector's frame covering is cutaway to show the frame.

Figure 2 is a perspective view of the runoff deflector of Figure 1 but shown in an operative position.

Figure 3 is a side view of the deflector of Figure 1.

30 Figure 4 is a side view of the deflector of Figure 2.

Figure 5 is a side view of the deflector of Figure 1 but showing how the deflector responds to a truck's departure.

Figure 6 is a side view of the deflector of Figure 5 but showing how the frame can yield to an exceptionally tall truck.

Figure 7 is a side view similar to Figure 3 but showing a different deflector.

Figure 8 is a side view showing a truck pushing the deflector of Figure 7 from its pendant position toward its operative position.

Figure 9 is a side view similar to Figure 4 but showing the deflector of Figure 7.

Figure 10 is a side view similar to Figure 5 but showing the deflector of Figure 7.

Figure 11 is a side view similar to Figure 3 but showing a different deflector.

Figure 12 is a side view similar to Figure 4 but showing the deflector of Figure 11.

Figure 13 is a side view similar to Figure 5 but showing the deflector of Figure 11.

Figure 14 is a side view similar to Figure 3 but showing a different deflector.

Figure 15 is a side view similar to Figure 4 but showing the deflector of Figure 14.

Figure 16 is a side view similar to Figure 5 but showing the deflector of Figure 14.

Figure 17 is a side view similar to Figure 3 but showing a different deflector.

Figure 18 is a side view similar to Figure 4 but showing the deflector of Figure 17.

Figure 19 is a side view similar to Figure 5 but showing the deflector of Figure 17.

Figure 20 is a side view of another deflector.

Figure 21 is a side view similar to Figure 7 but showing the deflector of Figure 20.

Figure 22 is a side view similar to Figure 8 but showing the deflector of Figure 20.

Figure 23 is a side view similar to Figure 9 but showing the deflector of Figure 20.

Figure 24 is a side view similar to Figure 10 but showing the deflector of Figure 20.

Description of the Preferred Embodiment

Figures 1 – 5 show a loading dock 10 that includes a water runoff deflector 12 mounted to a building wall 14 above a doorway 16. A truck 18, trailer, or other
5 vehicle can back underneath deflector 12 so that a seal 20 of the deflector rests atop the truck's roof. Seal 20 helps prevent water 22 (snow, rain, ice, slush, etc.) on the truck's roof from flowing off the back end of the truck and spilling into the building. Seal 20 helps block any water 22 flowing along the truck's roof toward doorway 16 and redirects the flow off to either side of the truck. Although deflector 12 is shown
10 being used with a dock seal 24, deflector 12 could instead be used with a dock shelter or could be used alone without either a dock seal or a dock shelter.

In some embodiments, deflector 12 comprises frame 26, seal 20, a hanger 28 that suspends seal 20 from frame 26, and a front bumper 30 that helps protect seal 20 from the impact of truck 18. In response to truck 18 entering or leaving dock 10,
15 deflector 12 may move to a pendant position (Figures 1 and 3), an operative position (Figures 2 and 4), or various departing positions (Figure 5).

Before truck 18 enters dock 10, seal 20 of deflector 12 hangs in a pendant position as shown in Figures 1 and 3. In this position, seal 20 hangs directly underneath a pivotal axis 32 about which seal 20 and hanger 28 can rotate.

20 As truck 18 backs underneath deflector 12, an upper rear edge of truck 18 engages front bumper 30 and forces bumper 30 and seal 20 to pivot upward and toward wall 14 until seal 20 rests atop the truck's roof as shown in Figure 4. In this position, seal 20 creates a dam or an obstruction to water 22 tending to flow back toward wall 14. Instead of flowing off the back end of truck 18, the water is now
25 redirected to flow off to either side of truck 18.

The construction of seal 20 may vary, but in some cases, seal 20 comprises a cylindrical foam pad encased within a pliable covering. A portion of the covering may extend upward from seal 20 to axis 32, whereby hanger 28 is made of a pliable panel 34. Panel 34 and the covering around seal 20 may be any of a variety of
30 materials including, but not limited to, HYPALON, canvas duck, rubber-impregnated fabric, and coated nylon or polyester fabric. The simplified design provides seal 20 and hanger 28 with significant flexibility, even though the construction inhibits seal 20 from continually rotating about itself.

Front bumper 30 preferably includes a lower panel 36 that is stiffer than the material of hanger 28 and the covering of seal 20 so that panel 36 can effectively lift seal 20 onto the top of truck 18. Panel 36 can be made of a variety of materials including, but not limited to, polyethylene, polypropylene, etc. When truck 18
5 departs, high forces between panel 36 and the rear edge of truck 18 (which forces may be increased by the presence of upwardly protruding lip 38) can be avoided by having a more flexible upper panel 40 (e.g., HYPALON, canvas duck, rubber-impregnated fabric, coated nylon or polyester fabric, etc.) suspend lower panel 36 from frame 26.

Figure 5, for instance, shows lower panel 36 being caught by lip 38 as truck 18
10 pulls away from the dock. The greater flexibility of upper panel 40, however, allows bumper 30 to readily yield without damage as truck 18 continues to move forward away from wall 14. After the truck leaves, deflector 12 can return to its original pendant position of Figure 1.

If an exceptionally tall truck 18' pulls out from underneath deflector 12, as
15 shown in Figure 6, frame 26 can yield with upward pivotal motion about points 42. In this case, frame 26 preferably includes a pliable sheet 44 (e.g., HYPALON, canvas duck, rubber-impregnated fabric, coated nylon or polyester fabric, etc.) or some other flexible member (e.g., a cable, chain, strap, etc.) whose tension limits the downward pivotal movement of the frame. Thus, frame 26 can yield by pivoting upward, but the
20 tension in sheet 44 helps prevent the frame from drooping. Indeed, sheet 44 serves in some sense as a structural member in the depicted embodiment, since the load of the frame and the suspended seal 20 and bumper 30 is borne by sheet 44. Using the tensile strength of sheet 44 in this manner yields a desirable frame design that minimizes the need for structural metal while providing enhanced functionality and
25 aesthetics as compared to conventional designs. Moreover, sheet 44 serves the additional function of creating a canopy/awning/hood over the top seal assembly.

In some embodiments, as shown in Figures 7, 8, 9 and 10 (Figures 7, 9 and 10 correspond to Figures 3, 4 and 5 respectively), a deflector 46 includes a front bumper 48 that comprises a plurality of interconnected panels 50, 52 and 54. Individually the
30 panels are relatively stiff, but are pivotally interconnected so that bumper 48 yields more readily in one direction than another. This creates a bumper that acts relatively stiff as truck 18 backs into the dock (Figure 8), whereby the stiffness helps in lifting seal 20 atop of truck 18. Yet, bumper 48 is more yieldable to reduce forces between

lip 38 and bumper 48 as the truck departs (Figure 10). The bumper's variation in yieldability can be achieved by having a pivotal joint 56 of adjoining panels be at an intermediate position between the upper and lower edges of a given panel.

In another embodiment, shown in Figures 11, 12 and 13 (which correspond to
5 Figures 3, 4 and 5 respectively), a deflector 58 includes a rotatable seal 60 suspended from a rigid hanger 62 that can pivot about an upper axis 64. A back bumper 66, in the form of a generally rigid plate, is attached to hanger 62 to help provide front bumper 30 with some back support and to help prevent lip 38 from catching on any edges of hanger 58 as truck 18 departs. Seal 60 preferably extends in front of back
10 bumper 66. In some cases, back bumper 66 is fully contained within a region 68 defined by two converging imaginary planes 70 and 72 that lie tangent to the peripheral surface of seal 60 and intersect axis 64. With back bumper 66 in such a receded position, the back bumper does not have to be as sturdy since front bumper 30 and seal 60 absorb much of the truck's impact.

15 Figures 14, 15 and 16 show a deflector 74 that is very similar to deflector 58 except a back bumper 76 replaces back bumper 66. Back bumper 76 is a curved rigid plate that includes a curved distal edge 78. The curvature of edge 78 makes it especially unlikely for lip 38 of a departing truck to adversely catch on anything of deflector 74.

20 Another deflector 80, shown in Figures 17, 18 and 19, includes a front bumper 82 whose structure is very similar to that of back bumper 76 of deflector 74. A seal 84 of deflector 80 includes an internal metal pipe 86 for added weight, which increases the sealing force that seal 84 applies to the roof of truck 18.

In another embodiment, as shown in Figures 20 - 24 (Figures 21, 22, 23 and 24
25 correspond to Figures 7, 8, 9 and 10 respectively), a deflector 90 includes a front bumper 92 that comprises a plurality of interconnected panels 94, 96 and 98. Individually the panels are relatively stiff, but are pivotally interconnected so that bumper 92 yields more readily in one direction than another. This creates a bumper that acts relatively stiff as truck 18 backs into the dock (Figure 22), whereby the stiffness helps in lifting seal 20 atop of truck 18. Yet, bumper 92 is more yieldable to
30 reduce forces between lip 38 and bumper 92 as the truck departs (Figure 24). In this case, the bumper's variation in yieldability is achieved by having panels 94, 96 and 98 be interconnected by a plurality of flexible panels 100, 102 and 104.

Although the invention is described with reference to presently preferred embodiments, it should be appreciated by those skilled in the art that various modifications are well within the scope of the invention. Therefore, the scope of the invention is to be determined by reference to the claims that follow.